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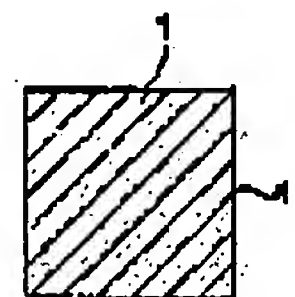
(54) JOINING METHOD OF TITANIUM AND ALUMINUM

(57)Abstract:

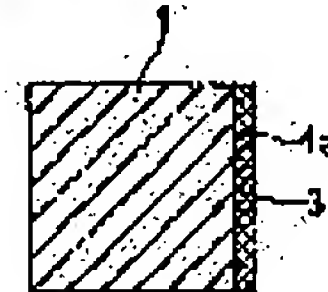
PROBLEM TO BE SOLVED: To provide a joining method of titanium and aluminum which does not require special equipment and a special joining environment and makes joining in the atmosphere possible.

SOLUTION: Prior to joining between a titanium material 1 of a base metal and an aluminum material 2, surface defatting and a blast treatment is done on a joining face of a titanium material side, a thermal spray film layer 3 of aluminum base is formed thereon, further subjected to a fusion diffusion treatment with TIG welding. The titanium material 1, which has the thermal spray film layer after the fusion diffusion treatment as a joining face, and the aluminum material 2 are butted, both are joined with using TIG welding using an aluminum filler material or brazing joining using brazing filler metal.

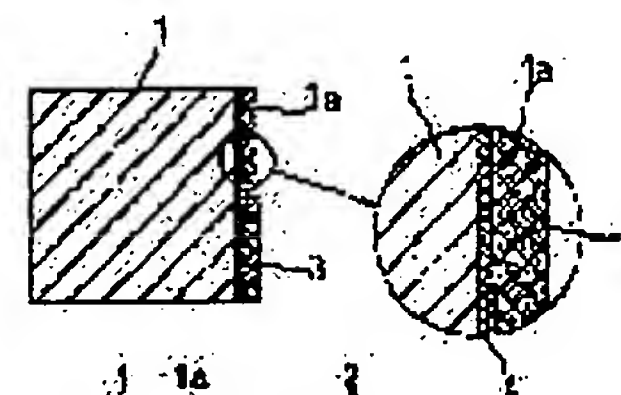
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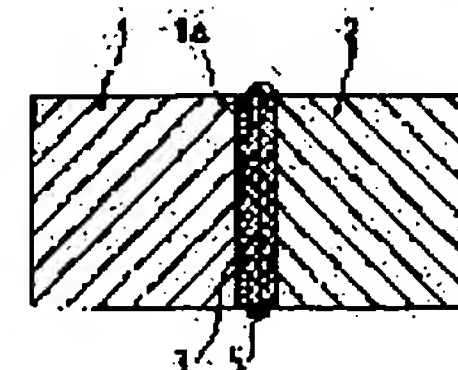
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(D)



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the approach of joining firmly titanium (a titanium alloy being included) and the aluminum (an aluminum alloy being included) which is a dissimilar metal by welding or soldering.

[0002]

[Description of the Prior Art] In order that the titanium system ingredient which are pure titanium and a titanium alloy may form a hard and weak intermetallic compound at the time of dissimilar metal welding with other metallic materials including an iron system, the dissimilar metal welding itself is fundamentally made impossible, and approaches, such as explosion cladding besides a soldering conjugation method and diffused junction, are adopted as junction into a titanium system ingredient and an aluminum system ingredient.

[0003]

[Problem(s) to be Solved by the Invention] It is used to junction into a titanium system ingredient and an aluminum system ingredient comparatively mostly. The RF soldering method and the soldering-in furnace method Since it curses in a controlled atmosphere predetermined [, such as argon gas,] or a vacuum and is working, It is necessary not only to fully perform a controlled atmosphere, but since a facility of dedication is needed, a cost rise is obliged with the jump of an installation cost, so that components, such as H, O, N, and C, may not be absorbed especially during an activity.

[0004] Moreover, explosion cladding and the diffused-junction methods other than a soldering method need a facility large-sized beyond a soldering method, and special, the actual condition is adopted only as junction of a particular application, and it cannot say them as a general junction technique easily.

[0005] This invention was not made paying attention to the above technical problems, and tends to offer the junction approach which enabled junction into the titanium system ingredient under an atmospheric-air ambient atmosphere, and an aluminum system ingredient, without needing special appliances and a specific ambient atmosphere.

[0006]

[Means for Solving the Problem] In invention according to claim 1 joining the aluminum system ingredient which is the titanium system ingredient, the aluminum, or the aluminum alloy which is pure titanium or a titanium alloy The process which uses an aluminum system ingredient for the plane of composition by the side of a titanium system ingredient as a thermal spray material, and performs thermal spraying, It is characterized by including the process which performs TIG arc welding or soldering after comparing a titanium system ingredient and an aluminum system ingredient with the process which performs melting diffusion process to the sprayed coating layer by making the sprayed coating layer after melting diffusion process into a plane of composition, and joins both.

[0007] Invention according to claim 2 is characterized by performing blasting processing to the plane of composition of a titanium system ingredient in advance of the thermal-spraying processing in invention according to claim 1.

[0008] Invention according to claim 3 is characterized by being what the melting diffusion process of

the sprayed coating layer in invention according to claim 1 or 2 depends on a TIG-arc-welding method. [0009] It is desirable to perform surface cleaning processing of a plane of composition before the above-mentioned blasting processing or to the back, and the thickness of a sprayed coating layer has the desirable range of 0.1-1.0mm, when it takes into consideration becoming the ease of the melting diffusion process following it, and the plane of composition of weldbonding.

[0010] therefore, in invention according to claim 1 to 3 After performing blasting processing, thermal spraying, and melting diffusion process to the part which should serve as a plane of composition of a titanium system ingredient in order under an atmospheric-air ambient atmosphere [whether it solders under an atmospheric-air ambient atmosphere using silver-aluminum system wax material (Ag-aluminum system wax material), aluminum radical wax material (what made pure aluminium and an aluminum alloy wax material as it was), etc., and] Or TIG arc welding is given by the well-known approach using the filler metal of an aluminum system. Since the compatibility of the aluminum system thermal spray material which carried out melting diffusion, and the aluminum system ingredient used as welding materials or wax material, and the base material of the other party is very good to the plane of composition of the titanium system ingredient used as a base material according to this approach, though it is junction of dissimilar metals, the firm junction force is acquired.

[0011]

[Effect of the Invention] According to this invention, the effectiveness that junction into the titanium system ingredient and aluminum system ingredient which are a dissimilar metal ingredient is easily realizable is in atmospheric air, without needing special appliances and a special environment.

[0012]

[Embodiment of the Invention] Drawing 1 is drawing showing the gestalt of desirable operation of this invention, and shows the procedure which joins the aluminum system ingredient (pure aluminium or aluminum alloy) 2 as well as the titanium system ingredient (pure titanium or titanium alloy) 1 used as a base material.

[0013] Blasting processing is performed after performing surface cleaning and acid washing to plane-of-composition 1a of the titanium system ingredient 1 used as the base material which is one side first, as shown in this drawing (A).

[0014] Subsequently, as shown in this drawing (B), pure aluminium or an aluminum alloy is used for plane-of-composition 1a to which blasting processing was performed as a thermal spray material, thermal spraying is performed to it, and the sprayed coating layer 3 is formed in it. The thickness of this sprayed coating layer 3 is set as the range of 0.1-1mm in consideration of the ease of the melting diffusion process mentioned later, the point that that sprayed coating layer 3 itself becomes a weldbonding side, etc.

[0015] Furthermore, as shown in this drawing (C), melting energy is given to the sprayed coating layer 3 formed previously by the TIG-arc-welding method, and melting diffusion process is performed to the coat layer 3. Thereby, the melting diffusion layer 4 is formed in the boundary of the titanium system ingredient 1 and the sprayed coating layer 3 of an aluminum system which are a base material.

[0016] Then, as shown in this drawing (D), after comparing the titanium system ingredient 1 which is one base material, and the aluminum system ingredient 2 which is the base material of another side by making the sprayed coating layer 3 after the above-mentioned melting diffusion process into a plane of composition, using the charge of filler metal of an aluminum system, TIG arc welding is given with a conventional method, and weldbonding of the titanium system ingredient 1 and the aluminum system ingredient 2 which are a base material is carried out. In addition, a sign 5 shows a weld zone.

[0017] Or it changes into the above-mentioned TIG arc welding, and soldering junction of the titanium system ingredient 1 and the aluminum system ingredient 2 which are a base material is carried out using silver-aluminum system wax material or aluminum radical wax material. As wax material, they are Ag-33aluminum, Ag-50aluminum, and Ag-30 aluminum-nickel, for example. or Mn, aluminum play JINGU sheet, etc. are suitable.

[0018] The above-mentioned TIG arc welding or soldering junction is performed in atmospheric air.

[0019] When this invention person produced the above-mentioned TIG arc welding and the sample by

soldering junction, respectively and measured each bonding strength, he checked that sufficient bonding strength required in any case was obtained.

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CLAIMS

[Claim(s)]

[Claim 1] In joining the aluminum system ingredient which is the titanium system ingredient, the aluminum, or the aluminum alloy which is pure titanium or a titanium alloy The process which uses an aluminum system ingredient for the plane of composition by the side of a titanium system ingredient as a thermal spray material, and performs thermal spraying, The process which performs TIG arc welding or soldering after comparing a titanium system ingredient and an aluminum system ingredient with the process which performs melting diffusion process to the sprayed coating layer by making the sprayed coating layer after melting diffusion process into a plane of composition, and joins both, The junction approach of of the titanium and aluminum which are characterized by including **.

[Claim 2] The junction approach of of the titanium according to claim 1 and the aluminum which are characterized by performing blasting processing to the plane of composition of a titanium system ingredient in advance of thermal-spraying processing.

[Claim 3] The junction approach of of the titanium according to claim 1 or 2 and the aluminum which are characterized by being what the melting diffusion process of a sprayed coating layer depends on a TIG-arc-welding method.

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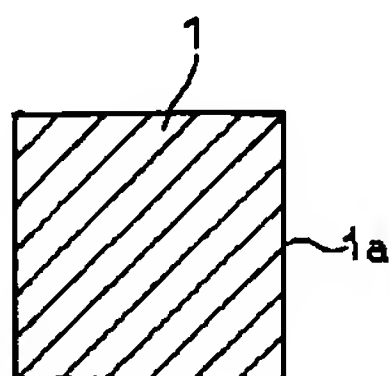
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DRAWINGS

[Drawing 1]

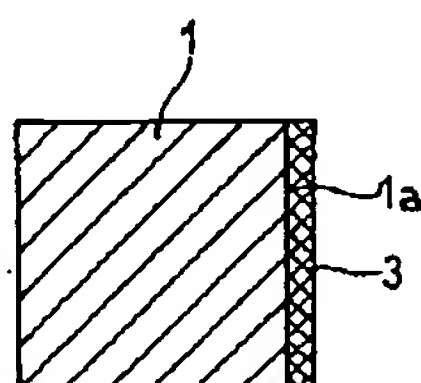
(A)

- ・表面脱脂
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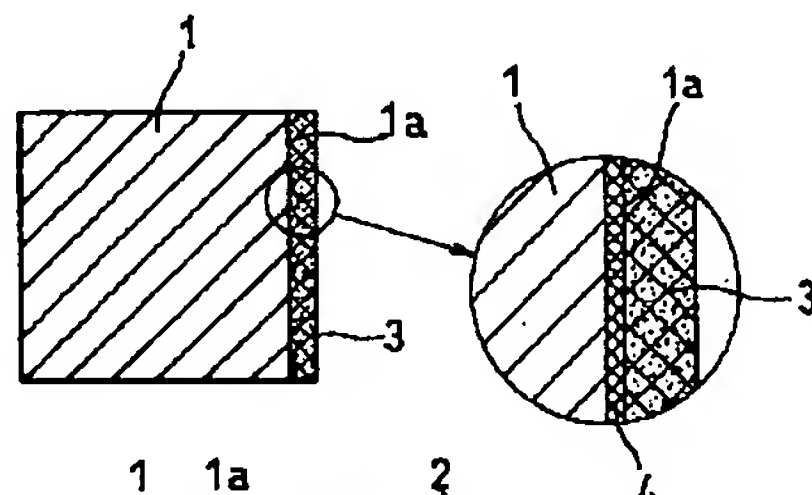
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- ・アルミニウム溶射



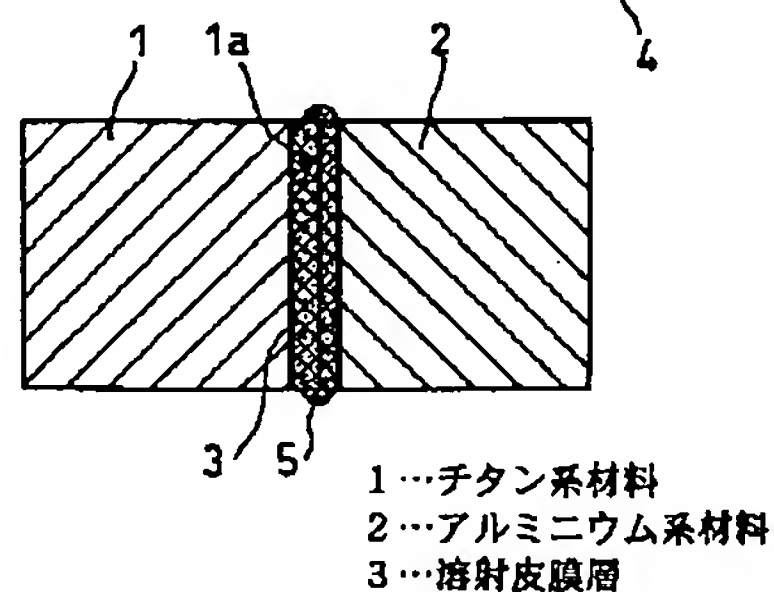
(C)

- ・溶融拡散処理



(D)

- ・TIG溶接
- または
- ・ろう付け接合



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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The process explanatory view showing the gestalt of more concrete implementation of the junction approach of this invention.

[Description of Notations]

- 1 -- Titanium system ingredient
- 2 -- Aluminum system ingredient
- 3 -- Sprayed coating layer

[Translation done.]